CLASS XII · CBSE	PHYSICS	Date: _____
Time: 15 Minutes	WORKSHEET – 1	Max. Marks: 10

TOPIC: 8.1 EM WAVES – INTRODUCTION · 8.2 DISPLACEMENT CURRENT

Answer the following. Q. 1 to 5 carry 1 mark each; Q. 6 carries 2 marks and Q. 7 carries 3 marks.

1. A plane electromagnetic wave travelling along the X-axis has a wavelength of 10.0 mm. The electric field points along the Y-direction and has a peak value of 30 V/m. The magnetic field, in terms of x in metre and t in second, may be expressed as **[1M]**

(a) $30 \sin 200\pi(ct - x)$ (b) $10^{-7} \sin 200\pi(ct - x)$
(c) $30 \sin (2\pi/10)(ct - x)$ (d) $10^{-7} \sin (2\pi/10)(ct - x)$

2. Out of the following options, which one can be used to produce a propagating electromagnetic wave? **[1M]**

(a) A chargeless particle (b) An accelerating charge
(c) A charge moving at constant velocity (d) A stationary charge

3. What oscillates in electromagnetic waves? **[1M]**

4. In which situation is there a displacement current but no conduction current? **[1M]**

5. The charging current for a capacitor is 0.25 A. What is the displacement current across its plates? **[1M]**

6. When an ideal capacitor is charged by a *dc* battery, no current flows. However, when an *ac* source is used, the current flows continuously. How does one explain this, based on the concept of displacement current? **[2M]**

7. A capacitor, made of two parallel plates each of plate area A and separation d, is being charged by an external *ac* source. Show that the displacement current inside the capacitor is the same as the current charging the capacitor. **[3M]**

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CLASS XII · CBSE	PHYSICS	Date: _____
Time: 15 Minutes	WORKSHEET – 2	Max. Marks: 10

TOPIC: 8.1 EM WAVES – INTRODUCTION · 8.2 DISPLACEMENT CURRENT

Answer the following.

1. In a plane electromagnetic wave, the electric field oscillates with a frequency of 2×10^{10} s^{-1} and an amplitude of 40 V m^{-1}.
(i) What is the wavelength of the wave?
(ii) What is the energy density due to the electric field?

2. Electromagnetic waves with wavelength
(i) λ_1 are used in satellite communication.
(ii) λ_2 are used to kill germs in water purifiers.
(iii) λ_3 are used to detect leakage of oil in underground pipelines.
(iv) λ_4 are used to improve visibility on runways during fog and mist conditions.
(v) Identify and name the part of the electromagnetic spectrum to which these radiations belong. Arrange these wavelengths in ascending order of their magnitude.

3. Suppose that the electric field of an electromagnetic wave in vacuum is

$$\mathbf{E} = \{(3.1 \text{ N/C}) \cos [(1.8 \text{ rad/m}) y + (5.4 \times 10^6 \text{ rad/s}) t]\} \hat{\mathbf{i}}$$

(a) What is the direction of propagation?
(b) What is the wavelength λ?
(c) What is the frequency ν?
(d) What is the amplitude of the magnetic field part of the wave?
(e) Write an expression for the magnetic field part of the wave.

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